

**The Rural Surgical Workforce: Current and Future Challenges**

By

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## Acknowledgements

When I began the work for this thesis, I had no idea where it would take me. I thought I would be looking at a fairly simple question: “Should the NHSC (National Health Service Corps) extend its loan repayment options to general surgeons who chose to practice in underserved, rural areas?” What I found was how little I knew about the complexity of rural health care, let alone surgical care in rural areas. Multiple literature searches and eight interviews later, I know that there’s a lot that I don’t know.

The one thing I do know is that I have been the recipient of profound generosity. Sue Tolleson-Rinehart PhD, my thesis advisor reshaped awkward sentences, helped to bring focus to the blurry, and believed in the importance of this work when I did not. She has shared her insights into the mechanics and humanity of policy in the classroom and over more than one beautifully cooked meal. She has made me a “policy wonk” for the rest of my life. Anthony Charles, M.D. took me in hand and to the Cecil B. Sheps Center in Chapel Hill where he introduced me to the researchers who power the ACS HPRI (American College of Surgeons Health Policy Research Institute). George Sheldon, M.D., emeritus chair of the Department of Surgery at UNC, provided articles, allowed me to interview him and contacted a number of his surgical colleagues asking them to allow me to interview them. My interview subjects gave me their time and a window into their world while forgiving my awkwardness as a novice investigator. The work that they have done and continue to do so well informs the best part of this work. The mistakes are my own.

Finally, I wish to thank Elizabeth Driesen, M.D, and Christopher Baker, M.D., mentors and dear friends, who demonstrate grace, humanity, and love in and out of the OR. They have shaped me as a physician and as a person. I am grateful beyond words.

## Abstract

Title: **The Rural Surgical Workforce: Current and Future Challenges**

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**Background:** The discourse about the rural health care workforce in the US has typically focused on the need for primary care physicians. There is a growing body of research on the characteristics of rural general surgeons although it is much smaller and less sophisticated than that on rural primary care physicians. There is growing concern that the aging of the rural surgical workforce and the continuing trend towards specialization will create or worsen shortages of surgical providers in rural areas. A number of proposals to slow or reverse this trend have been made including opening up National Health Service Corps loan repayment to surgeons who chose to practice in rural areas.

**Methods:** a systematic review of the literature (dating from 2000) identified major themes such as the importance of general surgeons to rural health care delivery, workforce characteristics of rural general surgeons (demographics, practice patterns), and program innovations that encourage residents to consider careers in rural areas. These themes formed the basis for in-depth interviews with eight key informants: five surgeons and three non-surgeons to formulate systematic arguments about the most important factors in recruitment and retention of surgeons in rural areas. Areas of inquiry included the nature of rural surgical practice, the reality of personal and professional isolation, how surgeons choose rural practice, the potential benefit of making surgeons eligible for NHSC (National Health Service Corps) loan forgiveness and how rural surgeons contribute to social capital in their communities.

**Results:** the informants agreed that the rural surgical workforce is under stress and that more must be done to recruit general surgeons to rural areas. Infrastructure and a perception that rural areas are less desirable than urban areas as living and work environments were seen as major impediments to recruitment. There was also strong agreement that rural is very different in different parts of the US and that this complicates the question of determining how best to supply surgical care to rural areas. A majority of the informants believed that medical students and residents from rural areas or small towns were more likely to choose rural practice. Creating the opportunity for relationships (via rural rotations) between residents or medical students and practicing rural surgeons was proposed as a way of bringing new surgeons into rural areas. Informants were divided on the question of NHSC loan forgiveness in part because two were unaware of the program's existence. One informant proposed that surgeons currently practicing in urban areas who were interested in relocating to rural areas be given economic support for transferring their practices. The three informants who had practiced or were currently practicing in rural communities described the importance and benefits of their involvement in the life of their communities.

**Conclusions:** rural areas in the US have difficulty recruiting and retaining general surgeons. The diversity of what constitutes rurality in the US and uncertainty as to the appropriate level of service for rural areas make it difficult to determine how many surgeons are needed to provide adequate care for rural areas. Future research on the rural general surgical workforce would benefit from rigorous evaluation of rural surgical training programming that currently exists at the medical student and resident level, investigation of why surgeons come to or leave rural areas, and what economic incentives are most likely to be effective.



## **Introduction**

In the US, provision of medical services in rural areas has largely focused on primary care practitioners, mainly family medicine physicians. Similar concern for provision of surgical care in rural areas has existed for some time but the body of research on general surgeons in rural areas is more recent and relatively small compared to that on rural primary care practitioners which dates from the 1970's. This study summarizes characteristics of the rural surgery workforce and explores issues that affect recruitment and retention of rural general surgeons.

## **Background, Significance and Methods**

This study combines a careful review of the scholarly literature with in-depth interviews to generate an understanding of challenges facing both rural surgeons and the health care system, as it struggles to recruit and retain general surgeons. The literature forms a theoretical foundation on which to build the evaluation of in-depth interviews. First, I present the results of a search for, and evaluation of, the extant body of literature, after which I review the contents of eight in-depth interviews with practitioners or expert observers.

***Searching the literature*** Following the best practices of systematic reviews of the literature, I identified a so-called "sentinel article" – one generally agreed to be a critically valuable reference – as a way of measuring the success of my search strategy. That sentinel article is "Interdependence of General Surgeons and Primary Care Physicians in Rural Communities" by Pathman and Ricketts (2009) and I hand-searched its references as the first stage of the search. I then conducted the remaining searches in Pub Med or Google Scholar (see Appendix 1) and gave priority to articles published after 2000. "Unrelated Search" articles came from searches for other papers, those forwarded to me by researchers at the ACS HPRI or those identified as related articles by Pub Med. In the end I reviewed a total of 47 articles and websites.

I arranged the articles into the following categories: interdependence of rural primary care physicians and surgeons, the general surgical and rural general surgical workforce, rural surgery training programs and National Health Service Corps (NHSC) expansion to include rural general surgeons and the importance of rural health workers to their communities. Tables 2 and 3 contain details of the studies discussed in the literature review. After reviewing the abstracts, I ranked the articles as follows: 1 = primary source 2 = supporting and 3 = peripheral.

***Interviewing key informants:*** The interview schedule (Appendix 2) used themes from the literature as a lens for discussing the experiences of the eight informants. Five are surgeons (RZ, GS, TH, DL, DS) with experience in rural practice and/or research on surgical workforce issues. The three non-surgeons (SL, DP, TR) include the administrator of a small hospital in rural Eastern North Carolina, a family practitioner who has written extensively on recruitment and retention of rural PCP's (including the role of the NHSC) and a researcher at the Shep's Center/ACS HPRI who has written extensively on surgical workforce issues. All interviews were audio taped with the permission of the subjects.

### **First Findings: The Results of the Literature Review**

In what follows, I organized the literature by themes ranging from the effect of surgeons' presence on rural hospital viability to current surgery practice and proposals for future training and preparation.

***General Surgeons, Primary Care Physicians, and Hospitals.*** Pathman and Ricketts (2009) write that a rural community's health depends on the availability and collegiality of both rural general surgeons (RGSs) and rural primary care providers (RPCPs).<sup>1,2</sup> RGSs are scarce: "Hospitals in towns with fewer than 10,000 persons ... have a median of only one surgeon on staff, and 909 rural counties—almost one-third of all United States counties—have no surgeons at all."<sup>1</sup>

Just as rural PCPs provide a wider array of services than do their urban or suburban counterparts (including procedures and obstetrical care); RGSs often fill roles delegated to specialists in urban areas.<sup>1</sup> Surgeons are crucial for maintaining the presence of a PCP and for



the economic health of small hospitals.<sup>1,2</sup> “Each surgical patient referred out of town is lost revenue ... and reinforces the behavior among the community’s residents of bypassing the local hospital to receive care in larger, distant facilities. Referring surgical patients away from the local hospital affects the practices of local primary care physicians by undermining the economic stability of their hospital and by reducing referrals for pre- and post operative medical evaluations and management.”<sup>1,2</sup>

Why do rural hospitals matter? Holmes, Slifkin, Randolph, and Poley (2006) found that when the sole hospital in a county closes there is a significant, persistent loss of per capita income and employment.<sup>3</sup> This particularly affects rural counties where one hospital is the norm. Increased distances imposed upon residents by hospital closure may also worsen outcomes and result in decreased utilization.<sup>3</sup>

***Surgical Workforce Characteristics.*** In a 2008 survey, Hudkins, Helmer, and Smith examined training and practice intentions of surgical residents.<sup>4</sup> 73% were male and 78% intended to pursue fellowships.<sup>4</sup> 81.5% anticipated working in a major or medium metropolitan area (> 999,999 and 100,000-999,999 population respectively), 13.4% in a small metropolitan area (< 100,000 pop.) and only 5.1% in a rural area.<sup>4</sup> The majority of respondents predicted working  $\leq$  80 hours per week (73.5%) while 30.1% predicted working  $\leq$  60 hours/week.<sup>5</sup> Women anticipated taking leave more often and earlier in their careers as well as taking less call, and performing fewer cases.<sup>4</sup> The authors’ conclusion: fewer generalists will be working fewer hours at a time when demand for surgical services is projected to increase between 14% and 47% in response to the aging of the American population.<sup>4</sup>

Using the AMA Physician Masterfile of 2001 and RUCA codes (Table 2) Thompson, Lynge, and Larson et al (2005) identified 17,243 active general surgeons age 62 (the average retirement age of fellows of the ACS) or younger versus 17,289 active general surgeons in 1994.<sup>5</sup> This small decrease in absolute numbers occurred at a time of significant population growth in the US.<sup>5</sup> Using the 2005 numbers, they calculated that surgeon to 100,000 population ratios were 6.40 overall, 6.53 urban, 7.71 large rural, and 4.67 small rural. In contrast to

previous estimates of about 10% surgeons in rural practice, Thompson et al calculated that 11.3% (1156) practiced in large rural and 9.5% (1636) in small isolated rural areas for a total of 20.8% practicing in rural areas.<sup>5</sup> Women (10.6% of surgeons) were more likely to practice in urban areas. General surgeons in small isolated rural areas were more likely to be older than 50 than were urban surgeons (51.6% vs. 42.1%).<sup>5</sup>

The authors conclude that smaller numbers of rural general surgeons may impair access to clinical services, trauma system function, rural hospital financial viability and surgical back-up for rural PCPs but they acknowledge that there are no criteria defining how many surgeons rural areas actually need. They suggest selecting more medical students from rural areas, medical school rotations with rural general surgeons, and rural training tracks in residency or rural fellowships post-residency as potential recruitment strategies.<sup>5</sup>

In a similar study, Lynge, Larson, and Thompson et al (2009) used AMA Masterfiles from 1981, 1991, 2001, and 2005 and county level urban-rural data from the Urban Influence Codes<sup>6</sup> to show that while the US population grew from 226 to 292 million from 1981-2005, the number of general surgeons fell by 25.9% from 17,394 to 16,662 or from 7.68 to 5.69 (per 100,000 pop.).<sup>6</sup> In urban areas the ratio decreased from 8.04 to 5.85 and in rural areas from 6.36 to 5.02. The number of graduating chief surgical residents per year, about 1000 (unchanged since 1980), the freeze on federally funded residency positions since 1997 and the increase from 55% to > 70% of residency graduates entering specialty fellowships all contributed to the decline in the numbers of general surgeons.<sup>6</sup>

Heneghan, Bordley, and Dietz et al (2005) surveyed samples of rural and urban general surgeons about their reasons for their choice of practice setting, their scope of practice, and how well their residency training prepared them for practice.<sup>7</sup> Surgeons were asked to report their yearly case numbers for general surgery, laparoscopic, vascular, thoracic, endoscopy, OB-Gyn, orthopedics, GU, OHNS, plastics and hand surgery.<sup>7</sup> Their survey attracted nearly 600 responses but, notably, the response rate for rural surgeons, 24.7%, was much lower than for the 74% response rate in their comparison group of urban surgeons. Six percent of rural

respondents practiced in communities of <2500 population, 50.7% in communities of 2500-10,000, and 43.3 % in communities of 10,000-50,000 designated as rural. 69.4% of urban respondents practiced in areas designated as urban with population > 50,000.<sup>7</sup> Approximately 1/3 of both urban and rural surgeons intended to leave their practice in the next 5 years. The length of time in current practice was similar: about 14 years. Income level, potential for professional development, hospital facilities and the quality of the surgical and medical communities were all more important to urban than to rural surgeons.<sup>7</sup> Quality of life was an important factor for 77% of all surgeons. 51.7 % of rural vs. 19.4% of urban surgeons reported professional isolation. Urban surgeons were much more likely to report having adequate support e.g. specialist presence, surgical assistants, and medical technology and were twice as likely to say that they had adequate vacation time and acceptable call schedules. Rural surgeons were more likely to have difficulty recruiting a partner (56.8 vs. 45%). 93% of urban surgeons vs. 80% of rural felt that their residency training had prepared them well. Rural surgeons were more likely to say that they needed more training in OB-Gyn, Ortho, GU, thoracic, plastic, hand, and endoscopy while 73% of both groups felt they needed more training in advanced laparoscopy.<sup>7</sup> Urban surgeons performed statistically significant higher rates of general, laparoscopic, and vascular procedures. Rural surgeons had statistically significant higher rates of endoscopy, OB/GYN and GU procedures.<sup>7</sup>

The authors concluded that workforce aging (the average age of respondents was 53) and the crucial part that surgeons play in rural health care necessitates quick action to avoid gaps in surgical coverage. They suggested exposing medical students and residents to rural surgery, recruiting medical students from rural areas, giving rural surgeons easy access to academic centers for CME/QI/consults and locum tenens coverage as strategies to increase the number of rural surgeons.<sup>7</sup>

Ricketts (2010) asserts that where surgeons choose to go and why is an important policy question within the context of efforts to convince physicians to go where there are shortages.<sup>8</sup> AMA Masterfile data from 1996 and 2006 identified 94,630 active general and subspecialty

surgeons under age 70 at both time points. In that period, 30,262 (32%) changed practice location at a time when about half the general US population also moved.<sup>8</sup> Abdominal and general surgeons were close to the average at 35% (OR = 1.3) while moving rates for thoracic, orthopedic sports medicine, and neurosurgeons were above average (about 40%).<sup>8</sup> The overall trend showed movement to areas with higher surgeon to population ratios.

Although two-thirds of established surgeons remained in place over the 10 year study period, the fact that a third moved and that deficits developed in previously well-supplied areas shows that shortages may develop relatively quickly. The trend of surgeons moving to areas with higher surgeon to population ratios contradicts the economics of seeking income maximization by avoiding competition and could be part of a trend to minimize management obligations including call.<sup>8</sup> This implies that economic incentives may not be sufficient to draw surgeons to rural areas where physician to population ratios are lower.

***Practice Patterns and the Call to Produce More Rural Surgeons.*** The literature repeats a common belief that rural general surgeons have a more diverse scope of practice and that a “broad-based” surgical education with a rural component can equip young surgeons to handle the challenges of practice away from large medical centers.

The Mithoefer Rural Surgery Center is based at Mary Imogene Basset Hospital (MIBH) in Cooperstown NY, a village of about 2500 people. Heneghan and Doty (2006) asked two questions: are the graduates of this broad-based general surgery residency program more likely to practice in rural areas and is the operative experience at a program like MIBH (where many of the rotations are in rural settings) substantially different from that of other general surgery programs?<sup>9</sup> The authors sent surveys to all 56 living MIBH surgical residency program graduates from the program’s inception in 1927 to 2003. Demographics, geographic location, practice characteristics, satisfaction with practice location, and residency experience were the categories of inquiry. 42 (75%) responded. 86% were male, the average age was 50, 21 (50%) had completed post-residency fellowships and 27 (64%) of the respondents primarily practiced general surgery. The other 15 (35%) practiced as specialists. The strongest finding is that 71%

(30) reported being raised in a rural area and 25 of these surgeons lived and practiced in a rural region, a strong association between rural upbringing and rural practice. Most of the general surgeons, 81% (22 of 27) lived in rural regions. MIBH residents from 2001-2004 performed significantly more GU, hand, Gyn, neuro, and ortho procedures than the national average (data from ACGME).<sup>9</sup>

In response to a request from the Rural Surgery Subcommittee of the Advisory Council for General Surgery of the ACS, Burkholder and Cofer (2004) surveyed surgical residency program directors to ascertain how well directors thought their programs prepared graduates to be truly general surgeons and whether additional components were needed to prepare surgeons to work in rural settings.<sup>10</sup> A secondary question (not accounted for prospectively in survey design) asked if there were differences between directors of research center based programs and those of non-research centers. To identify “research centers” they used US News and World Report’s ranking of the top 50 research medical schools.<sup>10</sup> The survey was sent to 242 program directors of whom 58 (24%) returned the survey; 45 were in non-research centers, 10 were in research centers, and 3 were anonymous and could not be classified. Three quarters of respondents agreed with the statement that it was part of their program’s mission to train general surgeons to be rural surgeons and this agreement was strongest in non-research center programs, in programs that had a rural surgery curriculum, and in programs with fewer residents. Directors of programs with a rural surgery component agreed most strongly that special curricula were needed to facilitate this career path but only slightly more third of programs had this component. While acknowledging the study’s weaknesses (low overall response rate, high response rate from rural training programs, and lack of definitive criteria for what constitutes rural surgery training) the authors conclude that more subspecialty training might help prepare surgeons to practice rurally and that special curricula could both help prepare surgeons and draw medical students interested in rural surgery.<sup>10</sup>

Two studies, one each from the University of Tennessee at Chattanooga and at Knoxville general surgery programs, analyze the experiences of senior residents (PGY-3 and PGY-4)

participating in 3 month long rural surgery elective rotations.<sup>11,12</sup> Both studies report increased number of cases logged, more exposure to endoscopy, and a more positive view of rural surgery practice and lifestyle.<sup>11,12</sup> Residents who completed the rural rotation reported an increased interest in rural practice.<sup>11,12</sup> Neither study presents data on residents who went into rural surgery but did not do a rural rotation.<sup>11,12</sup> At Knoxville, rural rotation participants who had fellowship training prior to entering rural surgical practice were more likely to have been interested in rural surgery prior to doing the rural rotation and were more likely to be satisfied with their practice than those who had not.<sup>11</sup>

Deveney and Hunter (2009) describe the process of establishing a year-long rural surgery option in their residency program at Oregon Health Sciences University.<sup>13</sup> In 2001 a surgical resident from rural Grants Pass, OR asked to spend his 4th year working there rather than doing a research. The town has a 125 bed hospital, 8 general surgeons, and several surgical specialists. His experience was so successful that a second resident followed him. Both residents performed 250-300 major procedures in their rural year indicating sufficient operative experience.<sup>13</sup> Participating 4<sup>th</sup> year residents gain experience in endoscopy and general surgical procedures, and rotate through the surgical specialties represented in Grants Pass: OHNS, OB-GYN, Orthopedics, and Urology. The setting immerses the trainee in rural life. Of the 10 residents who had completed this rotation at the time of publication, 3 went into fellowships and 3 directly into practice. Two are in rural practice in the US and internationally. Three are in small but not technically rural areas. Only one is an urban specialist. In comparison none of the other 55 graduates from this time period practice general surgery in a rural area and 71% are specialists.<sup>13</sup>

The medical school at East Tennessee State University (Johnson City, TN) was established in 1972 to serve rural Appalachia as well as the Mountain Home Veterans Administration hospital, also in Johnson City. Lockett and Browder (2009) describe the surgical residency curriculum at ETSU as “broad based” with emphasis in vascular, GI, surgical oncology, advanced laparoscopy, and upper and lower endoscopy.<sup>14</sup> Since 1983, 78 general

surgery residents have graduated from the program, 56 (72%) of whom are general surgeons, 58 (75%) live in communities of < 100,000 people, and 27 (35%) in communities of < 50,000. More than a quarter completed fellowships, 7 (9%) entered academic surgery, and 12 (15%) have remained in northeast Tennessee. A number of graduates have joined prior graduates who practice in small and medium rural communities and these practices have become referral centers for the rural areas around them.<sup>14</sup>

But is the perception of difference between urban and rural surgical practice accurate? In 2009, King, Fraher, Ricketts, Charles et al investigated the scope of practice of North Carolina surgeons working in 2004<sup>15</sup>, including 544 of 648 active surgeons in the final analysis. In North Carolina about 25% of surgeons live in non-metropolitan areas -- only 7.8% of surgeons nationally do so.<sup>15</sup> This mirrors population distribution since 31% of NC residents live in these areas compared to only 16% of the national population.<sup>15</sup> Using AHRQ Clinical Classification Software and Procedure Classes the authors identified 231 procedures which they grouped into 4 categories: minor diagnostic, minor therapeutic, major diagnostic and major therapeutic and 6 content areas: alimentary tract, abdomen, breast skin and soft tissue, vascular, head and neck, and surgical critical care. The authors categorized counties as metropolitan (containing at least one urbanized area of  $\geq 50,000$ ), micropolitan (at least one urbanized area 10,000-50,000), or rural.<sup>15</sup>

Seventy percent of surgeons practiced in metropolitan counties. Rural surgeons were older (51 vs. 48) and less likely to be female (4.8% vs. 8.5%). Metropolitan surgeons were much more likely (48%) than micropolitan (24.3%) or rural surgeons (38.6%) to report a second specialty. Rural surgeons were less likely to perform major therapeutic procedures and more likely to perform minor diagnostic procedures although total case volume was similar. The average urban general surgeon did 62 different types of procedures while rural surgeons on average did 54 types. The difference decreased from 8 to 3.9 after controlling for individual and county characteristics however, "...all surgeons in rural counties performed 7 of 10 procedures at least once—this was not true of any surgeon in micropolitan or metropolitan counties."<sup>15</sup>

If the findings from King et al are true for the country as a whole, then is the “broad based” training the best strategy for rural surgeons? Collister, Severenson, and LeMieur et al (2009) also question the benefit of this approach.<sup>16</sup> They declare that the current model of rural surgery: hernia/gallbladder, cesareans, trauma and basic OB-Gyn and orthopedics will be insufficient to reverse the trend of loss of patients and revenue to larger medical centers.<sup>16</sup> They argue that rural surgeons need to provide modern, advanced surgical services in order to retain patients and compete with larger centers. Specifically, rural centers must be able to offer flexible endoscopies, minimally invasive surgery (MIS) and advanced laparoscopy. In addition, if endoscopy reveals a disease for which surgery is the cure, the rural surgeon has to be prepared to provide that cure (e.g. laparoscopic colectomy for colon cancer). If a practice develops a particular expertise, they should share that with competing local surgeons so that the standard of care improves throughout the community.<sup>16</sup> Networks of core surgical specialties and anesthesiologists would replace the old model of a single surgeon or a small general surgery practice doing everything.<sup>16</sup> This in turn may facilitate recruitment of other general surgeons and will increase revenue (and sustainability) of the local healthcare system.<sup>16</sup>

Collister et al cite their experience with the Minnesota Institute for Minimally Invasive Surgery (MIMIS)<sup>16</sup> as the basis for their position. MIMIS parent organization was two CAHs (community access hospitals) in towns of < 3000. The authors believe early adaptation to new technologies was the chief factor in MIMIS’ success. With the assistance of device manufacturers, they became a regional training center for other surgeons in MIS. They eventually created a MIS fellowship (MIS/bariatric/flexible endosurgery), the only accredited fellowship based in a rural CAH.<sup>16</sup> Today, MIMIS encompasses all the surgical specialties at the parent hospitals, uses a quality assurance program adapted from NSQIP (the National Surgery Quality Insurance Program), and surveys every patient treated at MIMIS for outcomes and satisfaction.<sup>16</sup>

**Funding Mechanisms for Recruitment and Retention.** The National Health Service Corps (NHSC), established in 1972, is arguably the oldest and best established program for



recruitment and retention of primary care clinicians into HPSAs (Health Professional Shortage Areas) in underserved communities both rural and urban. Primary care physicians, nurse midwives, nurse practitioners, physician assistants, and dentists are eligible for NHSC scholarships and loan forgiveness program.<sup>17</sup>

In 2004, Dr. Thomas Russell, then the American College of Surgeons' executive director, issued the following statement in a letter on surgical workforce issues to the Council on Graduate Medical Education (COGME) regarding projected shortages of general surgeons.<sup>18</sup>

"The NHSC and other federal health professions programs play a vital role in addressing geographic and demographic access issues. While these programs currently provide training and funding for primary care physicians, nurses, and allied health professionals, the College believes the NHSC should be expanded to include general surgery.

The mission of the NHSC is to improve the health of the Nation's underserved population by providing comprehensive team-based health care that unites communities in need with caring health professionals and supports communities' efforts to build better systems of care... In many rural communities general surgeons often provide primary care, obstetrical, and emergency services in addition to surgical care. Also, general surgeons are often the sole providers of trauma care in rural areas. Expanding the NHSC to include general surgery would be an effective and cost efficient way to ensure underserved populations have access to essential surgical care."<sup>18</sup>

In their 2009 JAMA commentary, Saxton and Johns make a similar argument.<sup>19</sup> The strengths of the NHSC, namely its ability to identify communities in need that also have the capacity to "support care teams programs"<sup>19</sup> as well as its ability to recruit practitioners and train them in culturally competent care and teamwork, make it a natural choice for expanding surgical care availability. Including general surgeons is necessary because, "... the general surgeon is becoming just as endangered as the general internist and primary care teams cannot provide adequate care without access to surgically trained team members and resources...By admitting general surgeons, the NHSC could create new models of primary care teams."<sup>19</sup>

Recruiting is one thing, retention is another as studies of NHSC PCP's have shown. In a 2000 review of the history and future of the NHSC, Politzer, Tribble, and Robinson et al identified several problems related to retention.<sup>20</sup> Citing studies of several NHSC cohorts in the 1980's and 1990's, the authors found that displeasure with the NHSC's matching process, poor rapport/contact with/ and understanding of the NHSC's role by local health delivery organizations, poor treatment of NHSC physicians by communities and sites, and the program's response to problems raised by NHSC physicians all hampered retention.<sup>20</sup> In addition, rural-based NHSC physicians were less likely than non-NHSC physicians to have grown up in rural areas and only 38% were assigned to states where they had actually lived or trained making lack of family support an issue.<sup>20</sup> Lack of capacity or infrastructure that would allow underserved communities to recruit, retain, or make the best use of clinicians was a common problem and for those that were in a state of readiness, there simply weren't enough clinicians in the NHSC pipeline to meet the need.<sup>20</sup>

***What the literature lets us conclude.*** The body of literature on the rural surgical workforce in the United States is diverse and growing. Often passionate in its advocacy, it is also problematic. The use of multiple definitions of rurality, studies involving small sample sizes without meaningful control groups and the reliance on self-report all indicate a need for more rigorous methodology especially when evaluating current programs. Well designed qualitative studies with in-depth interviews of practicing rural general surgeons, rural primary care physicians, surgical residents, and NHSC and state funding program personnel would give a more accurate picture of the realities of rural surgical practice, the true state of need, and what interventions are most likely to be effective.

## **Second Findings: Talking to Those Who Have Walked the Walk**

This section digests the results of my in-depth interviews with five surgeons, including three who practice or have practiced in rural areas and three other experienced and expert observers as described in the first section.

***Why This Is Such a Complex Issue.*** There is no one size fits all definition of “Rural”. Providing surgical care to the vast spaces of the Great Plains and the Intermountain West is different than in the small towns of the eastern US. As TR stated, “There has to be some degree of transformation of view of what we’re talking about because rural is so many different things.”

Mary Imogene Bassett Hospital, a tertiary care center located in Cooperstown , NY (population 2500), acts as the hub to a number of smaller hospitals in upstate NY. More complex cases or emergencies beyond the scope of a smaller hospital can be transferred to Bassett within 1-2 hours (RZ). In the West, transfer times may be up to six hours. TH and DS, who practice in towns of population 13,000 and 15,000 respectively, commented on how different this was from working in even smaller towns.

Recruiting physicians of any sort to rural areas has always been difficult. One respondent recalls, “I remember going around with administrators of these small hospitals in North Carolina [in the 1980’s]. Usually the mayor would ... say, ‘We need to get a surgeon down here and do this and this and this’... one [hospital] didn’t even have 220V electricity in the OR. Then you’d look at their operative list for the year and 80% we would have done on an outpatient basis. You would look at the mayor’s automobile and he had bought it in Raleigh. So they’d [want to] get people in and yet they’d get a lot of their services out of town.” Even if infrastructure exists or can be created, it may not be enough. Part of the problem is how well rural areas “keep up” and whether local people will use local services. Rebuilding community confidence in the quality and safety of local surgical care so that patients will seek care locally can be a major task (SL).

Physician maldistribution to urban and suburban areas at the expense of rural areas is a problem throughout the world including developed countries.<sup>21</sup> This is equally true in the US. The low numbers of new general surgeons overall complicates provision of surgical services in rural areas where surgeons are often older and closer to retirement age. According to RZ, the source of the deficit is less important than acknowledging its effects: “The need for/ shortage of

general surgeons in rural areas has increased and I think that we're really beginning to look at this crisis ... whether or not this is an issue of us not having enough general surgeons overall or whether this is a maldistribution issue, doesn't really matter. The reality is that if you talk to little rural hospitals who are trying to recruit a general surgeon, it's really hard. They're looking for one to three years to try and get one."

There is the changing face of Surgery itself. The increasing trend towards specialization means fewer generalists and though the decline in hours worked by surgeons has been ascribed to the increasing numbers of female surgeons, younger surgeons of both sexes work or at least prefer to work fewer hours than their predecessors did.<sup>22</sup> DL states, "I think there is already and there is increasingly going to be a shortage of general surgeons in this country ... general surgeons in rural areas tend to be older, closer to retirement and more predominantly male in a time when 50% of medical students and an increasing percentage of general surgeons are female. There are no good studies on recruiting women general surgeons to rural areas. There have been some studies on recruiting women family practitioners to rural areas and it's harder. It may be because of hours and it may be because of difficulty having enough partners, etc. If I were a hospital administrator or a senior level partner in a rural area, that's something I would do my best to figure out."

Again DL, "I notice with our residents there are a surprising number of people who are very good and qualified to do anything they want ... who would like to go to a rural area but the lifestyle issues need to be addressed for people to go there. You can't just fall back on an antiquated dinosaur approach, 'I worked a hundred hours a week, so can they' because it doesn't work well in modern life."

The viability of rural areas is another variable. TR said, "I think it's fighting against a continuing tide. Some places will be selected and will have a chance to develop and 70% of the rest of things that are rural now will essentially decline. It's an urbanizing trend that has gone on for a long time."

What level of care should rural surgeons be expected to provide? What is appropriate? What is possible? What are the trade-offs? As GS put it, “The issue is really access to appropriate surgical care. Is that having practitioners there [or] having good communication and transport...it’s a mix of both. The formulas aren’t really well worked out.” TH believes rural care is inherently different than urban specialty surgery care: “Quality is important but you can’t expect rural surgeons to match the care offered by places with much more resources nor is it realistic to try and import the resources of a major academic medical center into every small town in Kansas”. In other words, don’t penalize rural surgeons for the type of care they offer. Expecting or demanding academic tertiary level care in rural areas, may result in worse care or no care at all. “You can’t expect that rural residents are going to have the same level of convenience and access. When you live in an area like that there’s an upside but you have to accept that there’s a downside as well. As a society, we have to work out what level of access is acceptable ... I guess it comes down to a question of how much is affordable and reasonable. It’s ultimately a political question.” (DL)

Is it a lack of money? Although TH thinks rural environments are becoming less economically viable, he also stated that a surgeon with 2-3 years experience could expect an income of \$450,000 per year. “There’s a perception that you don’t make any money out here... but you do. Money isn’t the answer but to do what you’ve always wanted to do and get paid well...if the social factors are right, money and fulfillment don’t have to be the stumbling block.” (TH). Would knowing the possibility for a good income would bring more people? TH’s response was, ““I think it would change the equation some. If medical students...had a rural rotation in medical school and they said, ‘I could be a radiologist or I could be a surgeon and it’s going to be about the same amount of money’, that would at least affect their thinking process.

But questions of money go beyond an individual surgeon’s income. As SL points out, the payor base makes a difference. In her area of eastern NC 77% of the patients are Medicaid or Medicare recipients. This coupled with high need but fluctuating patient volume tests the economic viability of providing all types of care including surgical services.

***Isolation, Professional and Personal.*** Respondents were divided on the presence and the effects of isolation. RZ said, “I think professional isolation is very real. I hear from a lot of guys out there who are the only surgeons in their town or their county and they have trouble talking to other surgeons about what to do about cases, they can’t really do M&M (Morbidity and Mortality), ongoing professional practice evaluation is really difficult.” TR believes that professional isolation is more of an issue than is social isolation, “Because surgeons generally want to do well, they want to keep up with what’s going on; they are sensitive to being able to have access to people who can help and work with them.”

The lack of local colleagues is a problem. “A big professional issue is having enough people to do the work...there’s somehow the belief that you need 10 primary care people but you only need one surgeon [and] that surgeons are quite glad to work every night. I think we’re seeing that get articulated as unacceptable by many of the younger people and it’s probably about high time.” (GS) DL notes that, “Call seems to come up as a big issue because often they’re in a 1-2 person practice and it can tough to get time off for family, for vacation, and for CME. It seems more and more that rural surgeons like surgeons everywhere are becoming hospital employees. Part of that is many appear to be negotiating to get the hospital to provide them with some locums coverage...which is reasonable if you consider that a hospital makes several million dollars a year off the back of your average general surgeon.”

For SL, surgeons are no harder to recruit than other doctors. In fact her last two surgical recruitments were relatively easy. Interestingly, both surgeons came from rural or semi-rural areas. However, while surgeons at her hospital (affiliated with University Health Systems based at the Brodie School of Medicine/Pitt Memorial Hospital in Greenville, NC) have access to training updates offered by academic surgeons at the parent hospital, they often cannot take advantage of these due to time and coverage constraints. DS felt that frequent call was less of an issue for small town general surgeons because the case types are fairly predictable and not much happens on call. TH however described the loneliness of being on call as one of a small handful of surgeons- -whatever comes through the door, it’s your job to take care of it. That can

be stressful especially for a less-experienced surgeon.

DS and TH, the two surgeons currently in rural practice, saw isolation, both professional and social, as less of a problem than any of the other interviewees. DS commented, "You have to be in the middle of Montana I think to be professionally isolated. I don't think you can be professionally isolated in North Carolina or Virginia or South Carolina...I don't think professional isolation is as big a problem. You can get a helicopter to someone in 10-20 minutes". TH acknowledged the difficulty of recruiting surgeons to rural areas but argued that the Internet and telemedicine have eased professional isolation for rural surgeons including himself. He does not see himself as professionally or socially isolated: "I'm a member of the ACS; I am invited to speak at places ... I have more opportunities in this environment than I ever had in an urban environment in terms of personal growth ... [My work] is the essence of fulfillment...I go to work each morning knowing that that day may be important to somebody. I have the ability ... to influence my environment much more than I did in Dallas. [If we want to build] in a new direction, if we want to institute a new program, we can do that." He sees his quality of life both professional and personal as very good. "It feels like going back to the stories of Marcus Welby and Ben Casey, the old style of medicine that was my role model growing up. I feel like I live that life." DS also cited both professional and social benefits: "You have a closer-knit medical community, a closer knit community in general, and that's a wonderful thing. I wouldn't trade it for the world...There's a lot of perks to being in a town like Charlotte and Norfolk but there's a lot of perks to not being in one." RZ notes that his time in Cooperstown was both personally and professionally satisfying: "For me it was the best of both worlds in a lot of respects. I got to live in a very beautiful place and I got to have a very sophisticated practice. There were some opportunities to work in some of our smaller affiliated hospitals on occasion and those really functioned more like a true rural practice...It was a real pleasure to work there."

Lifestyle issues may be particularly difficult for surgeons with families. Several respondents mentioned perceptions about the lack of cultural activities, job opportunities for spouses, and concerns about schools. SL describes recruiting physicians as her biggest

challenge especially with those who have spouses and/or children. The poor quality of public schools in her high-poverty region of North Carolina, the lack of social amenities, and the lack of potential jobs for the spouses of physicians make recruiting very difficult.

For DS and TH social isolation was not an issue. The rewards of rural or small town life include being an integral, valued part of the community and contributing to the life of the community in other ways than medicine. TH stated that life in McPherson has “made me a better citizen.” He is invited to sit on service boards and has written a column for the local paper. These things “drag me out of the hospital” whereas in Dallas (where he was part of a large general surgery group), “doctors mostly talked to other doctors.” He was equally pleased with the quality of life experienced by his family. DS said, “The people love you. They love to see you. You really do bond with your patients and I think that’s nicer than in a big town where [patients] go in to see the doctor and they don’t know who they’re going to see next.” She sees her involvement in activities such as her community theater as an outgrowth of the leadership skills she learned as a surgeon.

Such intimacy may lead to a “fishbowl effect” and the lack of anonymity may not be for everyone (RZ, GS). Additionally being so close can be difficult when patients become friends or friends become patients. The emotional pressure of diagnosing a terminal illness in this situation becomes, “back-breakingly hard”. (TH) HIPAA privacy regulations take on a new dimension when mutual friends are discussing your friend’s illness and you cannot divulge your own grief because you are also that person’s surgeon. (TH)

**Scope of Practice.** As in the literature, interview subjects had a range of opinions on the scope of practice in rural situations. A wider scope of practice may be an attraction of rural surgical practice. (RZ, GS) “I think they like the spectrum, they don’t feel constrained by the breadth of what they do although they all self-limit within reasonable grounds as responsible professionals which most of them are.” (GS) DL’s answer to the question synthesized the professional and the personal: “The American Board of Surgery looked at the case logs of rural and [urban] surgeons 10 years out and what they found (if I remember correctly) was that [rural



surgeons] were doing more endoscopy [and] fewer major pancreas, major hepatic, major vascular. They're probably doing more overall laparoscopies, largely lap cholies but there wasn't a lot of evidence for [rural] general surgeons doing a lot of ortho, urology, or OB-GYN. However, when I've spoken to rural surgeons it's apparent that what they do fluctuates massively depending on who's in town or not. If they lose their OB-GYN and their family practitioners are not trained or confident doing C-sections then all of a sudden it falls to them.

"It's a moving target. In the old days there were undoubtedly more general surgeons who routinely did C-sections and hips and stuff but now that's not part of general surgery training. We also have much better transportation networks and then there's the matter of litigation issues. ...it depends on where you land. If you're going to practice in a rural situation you'd want to do a good assessment of what you'll be asked to do and try and prepare yourself for it. It's not uncommon that people do that and then come back for extra training or do a post-graduate program like what they offer at Cooperstown and McMaster up in Canada."

For TH, "My scope of practice is exactly what I want it to be." He is an intensivist and traumatologist in addition to being a general surgeon. However, he also emphasized that this multifaceted practice is demanding and may not be the appropriate job for someone fresh out of residency or with minimal experience. He believes that performing a wide range of procedures is a problem not because they can't be learned but because in most major medical centers with fellowship programs, the general surgery residents are trained more narrowly.

The limiting factor may not be the competency of the surgeon but the lack of other services (e.g. radiation oncology for the treatment of breast cancer) or doing an operation that's "too big" for small-town hospital infrastructure. (GS)

DS accepts the limitations of her practice, "I think in a small community you can't do as much but really, do you want to do as much as you did in residency? Who really wants to be doing total esophagectomies with gastric pull-ups? It's a big operation, you don't have residents to cover for you so why would you want to do those kinds of things? You can do the real

general surgery part but to do the major surgeries, the Whipples, you can't do them in a small town.

"When I got here, I could have done anything I really wanted to but I had enough sense early on to know what a smaller town can handle so I gave up my dreams but that was fine because with the bigger cases have more complications. You work harder and longer and you're there all weekend and nights and that's not what I wanted. I wanted to raise a family and be comfortable." The important thing is to know your intentions for your personal as well as professional life so that you can prepare to fulfill them.

***Getting into Rural.*** What brings surgeons into rural areas and what keeps them away? Negative perceptions of Isolation and lifestyle are important deterrents but perhaps an even larger one is the lack of exposure in medical school and residency. (TH) RZ felt that the effects of rural rotations in medical school or residency could not be quantified but that, "intuitively they have to matter" although lack of longitudinal data on the effects of rural rotations makes designing programs to bring more surgeons to rural areas difficult. He believes that establishing relationships is important: "I think there is something to starting early. There is a resident in Cooperstown from Wyoming,...When he was a medical student he did a rotation in a little town in Wyoming with a general surgeon there and they kept in touch with him through his whole training...he ended up signing with them after his 3<sup>rd</sup> year of residency. They paid him a stipend starting then and he's joining them in July of this year. I think he got a real sense of what that place was like, liked it, and then also felt wanted and supported by them".

TH who precepts 3<sup>rd</sup> and 4<sup>th</sup> year medical students from the University of Kansas said that many of his students comment that after working in McPherson they could envision practicing in a rural area for the first time. GS believes that practitioners who go to rural areas intend to do so from the beginning of training and this intention was more likely than a rural surgery rotation to determine who would choose rural practice. GS: "I think intention is related to the choice of a person before they ever get there." DP's personal history of seeking out rural family medicine experience although he was not from a rural background also speaks strongly

to intent as does DL's choice to spend a year in the remote Ungava Peninsula during residency.

Much of the discussion on recruitment dealt with the concept of 'fit'. Fit can be as simple as a preference for living in a smaller community or as complicated as a personality trait that leads a surgeon to choose a practice in which he or she takes care of any local surgical issue. Based on his assessment of the family practice literature, RZ believes that rural upbringing is the strongest indicator of who will practice in rural areas. TH and DL share this belief. "Rural kids come back to rural environments." (TH) "But most important of all in a lot of cases, people who like practicing in those places are from those areas and [they and their spouses] want to go back...I think probably the most important thing for people going there and staying long term, [and] there are going to be exceptions to the rule, is to recruit people who are from there and who want to go back because they like the lifestyle." (DL) DS, who grew up in rural Illinois, wanted to return to a rural setting once she finished residency because she believed that this would offer the best quality of life for her and her family.

Pathman, Williams and Konrad et al (1996)<sup>23</sup> however found that the only two variables with a statistically significant relationship to retention were satisfaction with the community and opportunities to achieve personal goals. Conversely, lack of satisfaction with the fit between NHSC physicians and their repayment sites was a major reason for these physicians not remaining in their repayment sites.<sup>23</sup> Also, TH who left an urban environment is a strong example of fit, not of rural returning to rural. RZ qualified his citation of the family medicine literature by saying, "I think it's fit, I think it's people who want to be in that community, who believe in the mission of the organization they're working for."

How fit develops between a practitioner and a community is complex. TH and RZ emphasized the importance of positive exposure to rural practice. TH wondered if recruiting more rural students into medical schools might increase future numbers of rural practitioners. This might require medical schools to place more emphasis on evaluating background and life experience and to be less rigid about test scores. DL thought that the increased scope of practice might be an attractant: "At least one [surgeon] comes to mind who although not from a

[rural] area moved to an area like that and does an enormous range of surgery: thoracic, vascular, general surgery, bariatrics, specifically because he did not want to be constrained by sub-specialists that are a reality in urban areas.”

Serendipity was an important theme. TH was invited by a friend to check out McPherson and decided to relocate. Four surgeons he personally knows did locum tenens work in rural areas and decided that this type of practice and lifestyle were what they wanted.

Are “fit” and “intent” things that can be developed or cultivated? There is RZ’s account of the Cooperstown resident with the links to rural Wyoming who was from a different community also in rural Wyoming. He stated, “I think there are some people who are attracted to small rural places and then there are some people who just can’t imagine living in them. And what you need to do is figure out the people who are attracted to those places and develop relationships with them.”

In answer to the question, “How do you cultivate ‘fit’”? DP said, “...there will be people who are leaning that way who could be enticed and I don’t think we have any sense of what proportion of graduates from residencies are “enticeable” through this kind of incentive”, i.e. loan repayment. On intention: “Docs who wind up in rural areas have that orientation to begin with so they’re set up to establish those relationships and succeed. The training programs in the past have tended not to emphasize that or prepare the graduates to succeed in integrating into the communities. But my sense is among the primary care focused rural programs is that the majority now are giving some attention and truly the best ones are giving a lot of attention to this.

“So it takes the form of learning about rural sociology, learning about economic issues in rural areas, hopefully learning about power structures/power dynamics in rural areas, because you as an educated person with a good salary can’t avoid that. You will be immersed in that.”

Again DP: “In terms of how do we best teach this or prepare people to successfully integrate into rural communities, nothing that we’re doing has been tested and shown, ‘Yes this is the right thing’. ...Growing up in a rural area doesn’t seem to be enough. [Our] work has

shown that if you grew up in rural New England that makes you no more successful at integrating or being retained in the rural South than it does growing up in urban New England. It's more of a regional understanding so if someone who grew up in North Carolina is practicing in a small town in North Carolina, they're going to be staying longer than someone who grew up in the rural upper Midwest."

**No One Practices Alone.** There was strong agreement that the presence of other physicians, especially PCP's was important but respondents differed on what they considered necessary for successful practice.

RZ saw surgical backup as crucial for maintaining the breadth of rural PCPs' practice. "The presence of a surgeon in a small rural hospital is key. Having a surgeon allows the family doctor to take care of a bunch of stuff they wouldn't normally be able to take care of. For example if you admit a patient with bad diverticulitis, having the potential surgical back-up is good. The surgeon in many communities is the endoscopist so it allows care of things that need endoscopy. They're also backing up the family doctor by doing C-sections. They provide what little critical care is being provided. They're also the traumatologist. If you look at who's working in rural areas it's family docs and number two is general surgeons. So I think there is a symbiotic relationship between those specialties and I think generally they have very good working relationships."

GS felt that access to a wide spectrum of specialty care, not just primary care, was necessary for the practice of modern medicine: "Doctors are not interchangeable...You need a density of professional colleagues in other fields as well as in your own field so you're not doing all the work all the time. You need other people around who can do the things that you can't do. You have to have a spectrum of the 24 specialties in order to have modern medicine."

TH's specific concern was for anesthesiologists (and CRNA's) in rural places. "I'm no good without anesthesia...If we're going to keep general surgeons in rural areas; we've got to support rural CRNA's and anesthesiologists." For SL it is a question of having the right physicians in the right place at the right time which requires balancing high need against low

numbers. For example: as the lone urologist in her town nears retirement, her hospital is negotiating with a urology group practice to base one of their physicians there 3 days a week rather than trying to recruit a full-time urologist.

Like GS, TR believes that it's not enough to have a jack of all trades generalist: "There's a need for a wider range now because Surgery itself is sub-specializing. The general surgeon who does General Surgery is hard to find. There is by necessity the need to have more individual practitioners with different skills...I would say you're going to need more practitioners because of the way we're training." But how do we get those specialties involved in rural areas? Again, TR: "That's the big question. I don't know"...regionalization would be the way to structure some systems that would allow people to feel comfortable with being itinerant surgeons or taking referrals from places in a format and fashion that would allow for quality and care." GS believes that one strength of the Uniformed Public Health Service model (e.g. the Indian Health Service) is that it can bring in teams of practitioners. Indeed, this may be a key to retention as well as recruitment of surgeons. RZ commented, "I think this idea of a team is fabulous. I think you need all of these elements to have a vibrant hospital that's really able to take care of the majority of problems in their community." DS notes "We have hospitalists now which help a lot with management of the patient who's really sick. In our community we have a pulmonologist and we have cardiologists that come from Charlotte...and that does make it easier because you don't have to send as much out when you get a patient who's beyond your care." In other words, specialist care can keep revenues (surgical and otherwise) in a small area.

***Social Capacity/Social Entrepreneurship.*** Answers to the question of how rural communities could create capacity in order to draw physicians fell into three general categories: relationships, infrastructure, and economics. TR equated social capacity with economic development. This is hard to achieve because, "the nature of the economy favors places that are more complex and centralized...It's hard to take a place somewhere in the Plains or in the Midwest and say, 'We're going to build a 300 bed hospital here and turn that into the economic

engine.’ However it can be done...the hospital in Supply, NC has been able to develop an economic structure down near the coast. Some of these things work in some places...When you say social capital [it’s] equal to economic capital in this sense.” This is in line with GS’s remarks on hospital infrastructure and use of local services.

For DS and TH, relationships are at the heart of social capital. DS felt that lack of social capital was not the problem. The challenge is in making its presence known. “You’re part of a community and you feel like you’re part of a crowd. You have a closeness and a bond to everybody. I walk down the street and I know tons of people. I participate in the Chamber of Commerce and the local little theater group and all that. Those are the community perks that come with it. I don’t know how you can increase that as much as market it and explain that it is a perk.”

In turn, how do physicians enrich the social capital of small towns? Farmer, Lauder, Richards, and Sharkey et al (2003) wrote about the role of health care professionals in remote rural communities in the UK.<sup>24</sup> Local, accessible health care was valued by rural residents and was seen as one of the "core services" along with schools, churches, shops, and a meeting hall. The ability to obtain healthcare locally produces a feeling of security. Rural health care professionals are often deeply embedded in the social networks that make up the fabric of rural life. These networks are a major part of social capital making rural health care workers important producers of social capital.<sup>24</sup>

Farmer and Kilpatrick (2009) examined rural health care professionals as social entrepreneurs.<sup>25</sup> Defining a social entrepreneur as someone who "formally or informally generates community associations and networking that produces social outcomes"<sup>25</sup>, they interviewed health care workers in rural Scotland and Tasmania about their community activities outside of their health related work. They found activities as varied as refurbishing a closed shop for a community market to reviving knowledge of traditional Gaelic songs<sup>25</sup>. Health care workers acquired new skills such as grant-writing and negotiating with outside bureaucracies as representatives of their communities.<sup>25</sup> Among respondents, the most striking example of this

type of leadership activity is TH's work on a local committee establishing a scholarship endowment for local high school students. The goal of the endowment is to assist high school students in McPherson with college tuition and subsequent support/loan repayment if these same students go to medical school and return to practice in McPherson.

***The Role of Mid-level Providers.*** Mid-level providers (MLPs), namely Physician Assistants (PAs) and Nurse Practitioners (NPs) are growing in importance in the surgical workforce.<sup>22</sup> With the reduction in resident work hours and the need for continuity of care in both inpatient and outpatient settings, NPs and PAs have become valued members of surgical teams. There is a growing number of academic center post-graduate residencies in general surgery for PA's in the US at institutions such as Yale/Norwalk, Duke, John Hopkins, Montefiore, and Emory. I have personally known PA's and NP's in both academic and private practice settings who are first assistants in the OR.

Respondents seemed unaware of the extent of mid-levels' presence in the surgical world. RZ described mid-levels as providing the "glue" in rural surgical practice though not as participants in the OR. GS sees MLPs as primary care providers on surgical teams. TH questioned how much independence they should be granted (versus how much they think they're being promised) and accountability on the part of the operating surgeon. SL wondered how much call burden they actually take off of MDs if the attending still has to provide back-up. DL feels that mid-levels are problematic because unlike primary care, surgery is a specific manual skill. For DS, mid-levels are an unknown: "I thought of [hiring] one many years ago and I really couldn't see what they could help me with... They can't help me take call. They can help me in the office but they can't go to the operating room and scrub for me. They can't do my cases for me.

"The trouble is that office work doesn't generate a lot of income. There is no charge for post-op care. Surgery is a package deal. If a mid-level sees [a patient] and takes their staples out, I can't charge for what he did. I can't really recoup whereas a family doc could charge for that visit. I didn't see that the cost of a mid-level was going to be advantageous for what money



they could generate. But my colleagues who have them say they really can help in the office setting. You can concentrate on getting the pre-op people ready and not have to worry about [getting] all the stitches out and stuff like that. I think if you had a multiple practice with more people it could work.” TR however believed that MLPs were an important source of assistance and that surgeons should recognize their value as colleagues and professionals.

***Debt Forgiveness as Incentive.*** Several respondents thought expanding the NHSC to include surgeons might help address the shortage of surgeons in rural areas. TH saw a loan repayment option for surgeons as very important given that, “every one of my medical students has no less than \$200,000 in debt...if you can relieve that kind of debt load it changes the environment.” GS sees loan repayment primarily as a way of incentivizing public service but was more interested in doing this through the PHS perhaps because of its already existing infrastructure and potential for creation of health care teams. More important to RZ was that extending the NHSC option to surgeons would allow medical students interested in post-residency service to make other choices than primary care medicine. NHSC scholarships (as opposed to the loan repayment option) require this commitment early in medical school, which RZ felt was too soon given that many students do not choose a specialty until 3<sup>rd</sup> or 4<sup>th</sup> year. He believes that there are PCPs currently serving in the Corps who would “be great surgeons and who would want to be surgeons but they are unable to do it because of their NHSC requirements.”

DS wasn’t familiar with the NHSC but stated, “I think that would really be helpful because in our community we couldn’t get any other general surgeons to come...I was the only one for awhile. How they got the other guys to come is that they’re all on salary at the hospital. And that was the only way you could get them to come because the income is not as good and the perks they don’t think are as good because of the call schedule. So I think the kind of thing you are talking about would be very nice because so many hospitals can’t afford to hire a general surgeon.”

DL felt unqualified to comment on economic incentives but stated “I’ve said to some of the general surgery leadership who have been looking for support for rural surgery in terms of debt forgiveness from Congress, that one very good argument they can make to ally themselves with family practitioners is that I’ve heard from many a family practitioner and seen it in some of their literature that family practitioners are often loathe to locate where they don’t have surgical back-up.”

DP thought an NHSC option could help but might not make that much difference because surgeons’ starting salaries are high enough that educational debt is just not as important. “What we are seeing now is because [medical education] debt has increased it really is more of a motivator for where primary care docs are locating. I would assume that debt levels need to get to an even higher level before it would start being a strong influence on where surgeons are locating. On the other hand, people who are interested in rural practice are often more altruistic or more interested in having an impact on community. I can see that for those who are on the brink of thinking they would choose a rural area it may both sweeten the pie economically and tip them over to choosing a rural area.”

Another incentive model is hospital/health system based loan forgiveness. SL’s hospital offers \$10,000 in debt relief for every completed year of employment up to three years for all physicians.

***The Path Ahead or Getting Enough Now.*** A common theme found in both the interviews and the literature is that there is no single solution or approach to the problem of providing surgical care in rural America. RZ says, “I don’t think there’s going to be a one size fits all answer ... I think there has to be creative, flexible, regional models of care that begin to address some of these problems.” TH mentioned the Australian model where academic surgeons rotate to a rural area for a week every several weeks, take care of people giving respite to rural surgeons who in turn go to urban centers for refresher teaching.

Several respondents commented that regionalization is a reality and that increased collaboration/cooperation/communication between large centers and small centers is necessary

whether because it's the just thing to do even if not economically advantageous (TR), to ameliorate problems of physician distribution (SL) or because it's necessary for good patient care (TH). TH said, "There's too much of people leaving the rural center, having something big done in the urban center and then the next thing that the rural guy knows, there's a patient with a duodenal switch in the ER vomiting blood. No idea who did the operation or what the problems were but then you have this life and death situation. And that relates to the fragmentation of the entire system. We need [care] to be more seamless from little to big place and back. That will give us the best long-term outcomes."

TH noted that exposure to rural experience and debt repayment options are long-term solutions that may provide inadequate relief given the growing number of Americans eligible for Medicare. He proposed a unique solution: recruiting experienced general surgeons to rural areas with financial assistance from state /federal sources for the transition. This would bring surgical care to rural areas that badly need it while offering a new perspective on practice and possibly preventing burnout in those same surgeons. His own experience of leaving a large urban area for a small rural one and his personal knowledge of four surgeons who switched to rural practice after a locum tenens experience support this concept.

Whether loan repayment/financial incentives will be an effective recruitment/retention mechanism is an open question. Expanding and reconfiguring the NHSC and/or the Uniformed Public Health Service as a service obligation could provide as GS points out "the opportunity to let people have a couple years of public service which I quietly think everybody ought to do, either in the military or somewhere else, and let them get loan forgiveness... think they need to let everybody into that pool and get some service out of them." Medical school education and post-graduate training are largely financed in one way or another through the government. A required return of service for this assistance is appropriate and would bring more practitioners to underserved areas.

## **Conclusions and Policy Recommendations**

The literature establishes that there is a shortage of general surgeons in the rural US and that that shortage will worsen in the immediate future. The literature also describes efforts being made by some residency programs to introduce surgical trainees to rural practice and there is some evidence that these efforts increase the likelihood that residents will choose to practice in a rural area or small town. However, the numbers of residency graduates willing to go into rural practice are unlikely to meet the current or future need for surgical care. The need itself is difficult to determine because of the large variance in what constitutes rurality throughout the US. And while some voices have advocated for loan repayment as an incentive for bringing new surgeons to rural areas, there is no analysis of the effects of current loan repayment incentives for surgeons or which health care entities offer these incentives just as there is no single source available to residency applicants who are seeking a general surgery program with a rural training track or rotations.

The Family Medicine literature offers some insights into the difficulties of recruiting and retaining rural practitioners. The American Academy of Family Physicians and the National Rural Health Association note in a joint position paper (2008)<sup>26</sup> that rural physicians are dedicated and often passionate in their commitment to their communities, but, "... after 30 years of policy initiatives, incentives, and rural-focused programs the number of physicians in rural practice remains virtually unchanged and insufficient for the needs of rural communities."<sup>26</sup> Although 76% of graduates of family medicine rural track training (RTT) residency programs go into rural practice (compared to 30% for graduates of all types of family medicine residencies), these programs are a tiny fraction of family medicine programs.<sup>27</sup> Furthermore, they are more likely to have unmatched slots than traditional family medicine residency programs.<sup>27</sup>

The effect of financial incentives on rural recruitment and retention has been mixed. Pathman (2006) notes that completion rates are higher for loan repayment than for scholarships.<sup>28</sup> PCP's entering into loan repayment contracts are older and have a better idea of their career goals. Another avenue is service-option loans. These allow medical students to

pay off the obligation at normal student loan rates or give service. About 55% of students in the states that offer these programs choose service and almost all complete their obligations and demonstrate excellent satisfaction with and retention in their communities.<sup>28</sup>

But will surgeons be drawn by repayment incentives in the same way? Ricketts (2010)<sup>8</sup> demonstrated that surgeons unlike other physicians tend to move to areas where there are more surgeons and therefore more economic competition. If this is the case, then employing financial incentives to try and draw general surgeons to rural areas where there are fewer colleagues may be less effective especially since income levels between rural and urban surgeons may not differ widely.

The interviews further highlight the complexities of rural surgical workforce issues in ways that were not apparent in the articles. “It’s not just money, it’s not just a nice operating room, and it’s not just equipment. It’s a complicated formula and I don’t know all the elements of it.” (RZ) An important (and unanswered) question is what is the appropriate level of care to expect in rural areas? GS asks, “Is that by having practitioners there, having good communication and transport, and it’s a mix of both”. For administrators such as SL the question becomes: How can rural areas recruit enough surgeons so that one person isn’t on call every night and at the same time deal with the fact that rural areas may be low volume but high need? Interviewees all mentioned frequent call and professional and social isolation as obstacles to recruitment but the two interviewees who currently practice in rural areas have been very happy in their work and social life as have their families.

There is the problem of defining ‘rural’. Who does the defining and what is the effect of being so designated? TR observed, “... it turns out that the policy that says, ‘We’re going to do rural’, sets up a competition for people then to say, “Okay- -those who are competent and qualify as rural tend to get more things.’ Whereas those people who are less competent, [with] less social capital, the real rural, the real underserved places tend to lose out in the program processes that are supposed to support them most...So the solution set that says, ‘We’re going to support rural surgery tends to end up supporting Concord (the county seat of Cabarrus

County, NC about 20 miles from Charlotte, NC). [Cabarrus] is very happily a metro county, which at one time it wasn't, but that's the kind of place that gets built up." This is in stark contrast to poorer, more isolated communities such as in eastern North Carolina where SL is located.

Surgeons like other rural physicians are often deeply integrated in their communities. In their work on rural health care workers as social entrepreneurs, Farmer and Kilpatrick use Drucker's definition of entrepreneurs as "hardworking, flexible, and knowledgeable within their own field of work but with the capacity to take an external perspective...[he/she] always searches for change, responds to it, and exploits it as an opportunity" and Dees "social entrepreneurs are "change agents" who "create and sustain social value, look for opportunities, and engage in ongoing innovation, adaptation and learning"<sup>25</sup>, to describe the characteristics that rural practitioners bring to their communities. It is clear from the interviews, especially those with TH and DS, that rural surgeons value and are valued by their fellow citizens and that the leadership, commitment, and innovation directly stem from their training and work as surgeons.

**Policy Solutions.** Just as there is no single definition of rural, there cannot be a single area of activity or research to answer these questions and concerns. There are potential activities at the level of national and local government. There are programming changes that could be made at the medical school and residency level and there are potential areas of action for the American College of Surgeons and its Health Policy Research Institute.

How many hospitals/health system/states offer debt relief for physicians? How many of these are open to surgeons? What has the effect been on recruitment/retention? Do surgeons employed by the Indian Health Service tend to remain in their communities or do they move on after their term of service is done? What is the best way to make this information available? Although offering loan repayment to surgical residency graduates via the NHSC could proceed without this information, further policy innovations will require more data.

There are important counterarguments to the NHSC argument. As DP pointed out, since salaries are already fairly high for surgeons in rural areas the effect of such an incentive might be diluted and as Rickett's study shows, surgeons tend to gravitate towards areas of higher practitioner density even though this increases competition for income.<sup>8</sup> TH's idea of providing economic support for current practicing surgeons wishing to relocate has genuine potential to bring experienced hands to rural health systems. Other incentives such as guaranteed coverage that would allow rural surgeons time away for education, training, and vacation may be more effective than economic incentives.

One strategy for maintaining economic viability and for organizational cohesion is the salary model. RZ said, "I think if you have closed staff or an employed staff model everyone feels like they're playing for the same team and you can begin to put together policies and protocols to take care of people where economic competition isn't an issue." TH is salaried. SL's hospital uses salary and incentives to offer economic stability to incoming practitioners while they grow the practice and to increase productivity. But there are repercussions for independent surgeons. DS who over the course of her 25-30 year career has often been the only general surgeon in her town in the NC Piedmont notes that her local hospital's use of a salary model has brought in 3 other general surgeons which lightens the call load but has hurt her bottom line as an independent practitioner.

Regionalization and consolidation of health care facilities under the umbrella of a larger "health system" is not new. Both academic medical centers and privately owned systems continue to acquire smaller hospitals and independent practices. SL's hospital is part of University Health Systems. According to her, this relationship provides additional resources, professional support for doctors in the form of a physicians' council, and interaction with academic surgeons. DS notes that the Management Service Agreement between her hospital and Carolinas Medical Center in Charlotte, NC has increased access to specialists, allows her hospital to buy supplies at a lower cost, and increases negotiating power with insurance companies.

TR sees regionalization as a strategy for getting surgeons into rural areas. This may entail stopping surgical care at, "...some smaller hospitals that are still doing surgery somewhat inappropriately [and] potentially creating some mechanism to support regionalization of surgical services in some places where they wouldn't be regionally rational making sure there is appropriate transfer and referral opportunities." Like the trauma system there may be a role for local and national government.

Rural and Urban cooperation was also mentioned as a strategy. This could be as simple as more telemedicine/high speed internet resources or as complex as distributing resource richness. For TR this has an ethical component, "It would be good if people thought a little bit more about how they get beyond their beneficial perimeter to improve somebody outside of their scope. I'm speaking of the little places that are having some trouble. I'd like to see urban places adopting small places that they wouldn't find a business case for adopting." Other forms of support could be partnerships with academic centers. Whether an actual "trading places" program as occurs in Australia between academic and rural surgeons is feasible is a more difficult question in the complex medicolegal environment of the US.

As discussed above, there are no longitudinal data on the effect of rural rotations in medical school or residency. However, these opportunities may have a value that goes beyond recruitment numbers as they may forge relationships between interested trainees and rural areas. These relationships can be important for the emotional and psychological growth of new physicians and demonstrate that important medicine isn't confined to the academia or large urban hospitals.

As the interviews show, relationships are crucial both to bringing surgeons into rural areas and I suspect to the development of "fit". Fit is difficult to define and may have several components: pre-formed intention, an understanding of a region either because of a rural background or a desire for greater autonomy. In 2009, Hancock, Steinbach, Adler, and Auerswald published the results of qualitative interviews with 22 physicians in rural eastern California and western Nevada.<sup>29</sup> The majority were family practice physicians. The others



were board certified in emergency medicine, internal medicine, or pediatrics. 77% were male. All were middle aged, white, and married. 11 had grown up in rural areas or small towns and 11 in urban settings. In their review of the literature, the authors note that while rural upbringing is a prominent factor in choosing rural practice, 74% of all rural physicians are not from rural areas. What else contributes to choosing rural practice? From the literature and their respondents, the authors found that connection to a particular place forged during family vacations and/or recreational or job experiences was a strong predictor. A commitment to community service and/or a desire to provide care to an underserved community was also important. Nine of the 22 subjects did rural rotations in medical school or residency and 1 of the subjects had trained in a rural-oriented family medicine residency program, but only one of this group cited these experiences as a reason for choosing to practice in a rural area.<sup>29</sup>

Regarding retention, the authors note that the literature, "...implicates a variety of factors...including sense of place, community participation, self-actualization, and familiarity, though little is known about how these components act over time."<sup>29</sup> The interviews showed that retention evolved from the initial choice of what the physician believed would be a good place to practice and/or raise a family, to increasing involvement in the community and accumulation of social capital. These family physicians seem to have the same motivators for rural practice as reflected in the literature on rural surgeons and in the interviews particularly with DS and TH.

Identifying and recruiting more medical students from rural areas or who have a connection to rural places forged in other ways may be beneficial. Longitudinal data on programs aimed at recruitment and retention to rural practice with attention to upbringing, training, and mentoring experiences is crucial.

In turn, medical students interested in rural surgical practice need to know which residency programs have rural training components or are in rural areas. These programs and the ACS need to make this information easily available. When I googled "Family Medicine Residency, Rural Training Track" I immediately found a PDF with a list of programs. The same

search for rural General Surgery training produced no such document. Some of this information is available on FRIEDA but it needs to be Google ready to catch the moment.

As the profession struggles with the implications of the 80 hour work-week rule and the increasing number of trainees choosing specialization, what constitutes general surgery training and practice is under scrutiny. The programs with rural training tracks discussed in the literature review advocate for extended training in endoscopy (a bread and butter practice for many general surgeons in smaller areas) as well as acquiring a wide variety of surgical experience. The rural year at OHSU is the most comprehensive option. However, the MIMIS authors make an excellent point that rural patients just like non-rurals want the best, most up to date care possible and that training rural practitioners in these methods allows them to retain patients and revenue.

It is easy to focus on the technological wonders of Surgery. The increasing use of minimally invasive methods and the magic of robotics are reported in the lay press as well as the professional literature. But Surgery, like all Medicine, is a human endeavor with real people on both ends of the scalpel. As TR eloquently said, ““It would be good if people thought a little bit more about how they get beyond their beneficial perimeter to improve somebody outside of their scope”. Strengthening the rural general surgery workforce has the potential to revitalize and repair the social fabric as well as the medical infrastructure of “the little places that are having some trouble.” (TR) I think the benefits go both ways. Bringing surgery to rural areas or keeping it there will require ingenuity, flexibility, and thoughtfulness. What better way to teach young doctors and administrators that health care is a living, breathing entity and not the movement of cogs in a machine? I cannot think of a better inheritance for all of us.

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6. work force in rural America. *Arch Surg* 2005; 140(1):74-9.
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8. Heneghan, SJ, Bordley, J, Dietz, PA, et.al. Comparison of urban and rural general surgeons: motivations for practice location, practice patterns, and educational
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11. Doty, B, Heneghan, S, Gold M, Bordley, J, Dietz, P, Finlayson, S, Zuckerman, R. Is a Broadly based Surgical Residency Program More Likely to Place Graduates in Rural Practice? *World Journal of Surgery* 2006 (30); 2089-2093
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19. <http://nhsc.hrsa.gov/>
20. <http://www.facs.org/ahp/views/gme3.html>
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22. Politzer, R.M., Tribble, L.Q., Robinson, T.D., Heard, D., Weaver, D.L., Reig, S.M.L., Gaston, M. The National Health Service Corps for the 21<sup>st</sup> Century. *Journal of Ambulatory Care Management* Vol. 23(3), July 2000, p 70-85

23. Dolea, C., Increasing access to health workers in remote and rural areas through improved retention. Health Workforce Migration and Retention Unit, Department of Human Resources for Health, Cluster of Health System and Services, World Health Organization, Geneva, Switzerland. February 2009.
24. Private conversation with E. Fraher of the ACS HPRI.
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26. Farmer, J., Lauder, W., Richards, H., Sharkey, S. Dr. John Has Gone: Assessing Health Professionals' Contribution to Remote Rural Community Sustainability in the UK. Social Science and Medicine 57 (2003) 673-686
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28. <http://www.aafp.org/online/en/home/policy/policies/r/fammedruralpractice.html>
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## Appendix 1: Literature Search Codebook

Article	Source	Article Type	Article category 1 = Surgical Workforce 2= Rural Surgery 3 = Rural Primary Care 4 = NHSC 5 = other retention mechanism 6 = other	1 = Core 2 = supporting 3 = peripheral	Article Used for paper (Y/N) and reason rejected
Pathman, DE, Ricketts, TC. Interdependence of General Surgeons and Primary Care Physicians in Rural Communities. Surgical Clinics of North America 89 (2009) 1293-1302	Prior paper	Summary, Secondary data Analysis Policy Issue	2,3	1	
Thompson,MJ, Lynge, DE, Larson, EH, etal. Characterizing the general surgery work force in rural America. Arch Surg 2005;140(1):74–9.	Search 1	Secondary data analysis Policy Issue	1,2	1	
FinlaysonSR. Surgery in rural America. Surg Innov 2005;12 (4):299–305.	Search 1	Review Policy Issue	2 Note: Mitthoefer	1	

Heneghan, SJ, Bordley, J, Dietz, PA, etal. Comparison of urban and rural general surgeons: motivations for practice location, practice patterns, and educational requirements. J Am Coll Surg 2005;201 (5):732-6.	Search 1	Primary Data Analysis Policy Issue	1,2 Note: Mitthoefer	1	
3. COGME Summary of Tenth Report Physician Distribution and Health Care Challenges in Rural and Inner-City Areas February 1998 <a href="http://www.cogme.gov/rpt10.htm">http://www.cogme.gov/rpt10.htm</a>	Prior paper	Review Policy Issue	1,2,3	2	
Doty, B, Heneghan, S, Gold M, Bordley, J, Dietz, P, Finlayson, S, Zuckerman, R. Is a Broadly based Surgical Residency Program More Likely to Place Graduates in Rural Practice? World Journal of Surgery 2006 (30); 2089-2093	Search 1	Primary Data Analysis Policy Solution	1,2 Note: Mitthoefer	1	
Burkholder, HC; Cofer, JB. Rural Surgery Training, a Survey of Program Directors. J Am Coll Surg 2007; 204: 416-421	Search 1	Primary Data Analysis Policy Solution	2	1	
Galandiuk, S, Suhal, MS, Polk, HC, Turina, M, Rao, M, Lewis, JN. Differences and Similarities between Rural and Urban Operations. Surgery 2006; 140: 589-96	Search 1	Primary Data Analysis No policy content	1,2	2	Will not use- -poor definition of rural, only one urban community studied
Shively, EH, Shively, SA. Threats to Rural Surgery. The American Journal of Surgery 190 (2005) 200-205	Search 1	Some data analysis Policy Issue	2	2	

<p>Lyngge, DC, Larson, EH, Thompson, MJ, Rosenblatt, RA, Hart, LG. A Longitudinal Analysis of the General Surgery Workforce in the United States, 1981-2005. Arch Surg, 2008; 143: 345-350</p>	Search 1	Secondary data analysis Policy Issue	1,2	1	
<p>Chen, FM, Fordyce, MA, Andes, S, Hart, LG. U.S. Rural Physician Workforce: Analysis of Medical School Graduates from 1988-1997. October 2008. Final report #113. The University of Washington Rural Health Research Center</p>	Search 1	Primary Data Analysis Policy Issue	3	2	
<p>Holmes, GM, Slifkin, RT, Randolph, RK, Poley, S. The Effect of Rural Hospital Closures on Community Economic Health. Health Services Research 41:2 April 2006 467-485</p>	Search 1	Policy Issue	6		
<p>King, J, Fraher, EP, Ricketts, TC, Charles, AC, Sheldon, GF, Meyer, AA. Characteristics of Practice among Rural and Urban General Surgeons in NC. Ann Surg 2009; 249: 1052-1060</p>	Prior paper	Primary Data Analysis Policy Issue	1,2	1	
<p>Hudkins, JR, Helmer, SD, Smith RS. General Surgery Resident Practice Plans: A Workforce for the Future? American Journal of Surgery (2009) 198, 798-803.</p>	Unrelated search	Primary Data Analysis Policy Issue	2	2	

Humber, N, Frecker, T. Rural Surgery in British Columbia: Is There Anybody Out There? Can J Surg 2008 Vol 51, No. 3 179-184	Unrelated search	Primary Data Analysis Policy Issue	2	2	
Sim, AJ, Grant, F, Ingram, AK. Surgery in Remote and Rural Scotland. Surg Clin N Am 89 (2009) 1335-1347.	Unrelated search	Summary Policy Issue	2	2 to 3	
Doty, B, Zuckerman, R. Borgstrom, D. Are General Surgery Programs Likely to Prepare Future Rural Surgeons? Journal of Surgical Education 2009 66; 74-79	Search 2	Secondary data analysis Policy Issue Policy solution	2 Note: Mitthoefer	1	
Milligan, JL, Nelson, HS, Mancini, ML, Goldman, Mitchell. Rural Surgery Rotation During Surgical Residency. The American Surgeon 2009 Vol. 75 743-746	Search 2	Primary Data Policy Solution	2	1	
Lockett, M, Browder, W. Back to the Future: General Surgery Training at East Tennessee State University. The American Surgeon 2009 Vol. 75 11-14.	Search 2	Descriptive	2	2	
Giles, WH, Arnold, JD, Layman, TS, Sumids, MP, Brown, PW, Burns, RP, Cofer, JB. Education of the Rural Surgeon: Experience from Tennessee. Surgical Clinics of North America 89 (2009) 1313-1319	Search 2	Primary Data Policy solution	2	2	
Ricketts, TC. The Migration of Surgeons. Ann Surg 2010; 251: 363-367	Search 2	Primary Data Policy Issue	1,2	2	



Ricketts, TC, Randolph, R. The Diffusion of Physicians. Health Affairs 27, No. 5 (2008): 1409-1415.	Search 2	Primary Data Policy Issue	3	2 to 3	
Trends in Hospital Closure 1990-2000 DHHS May 2003 OEI 04-02-00610	Search 2	Report	6		
Collister, HM, Severson, PA, LeMieur, TP, Roberts, SA, Gujer, MW. Building and Maintaining a Successful Surgery Program in Rural Minnesota. Surgical Clinics of North America 89(2009) 1349-1357	Unrelate d search	Descriptive Policy solution	2	1 to 2	
Farmer,J, Kilpatrick, S. Are Rural Health Professionals Also Social Entrepreneurs? Social Science and Medicine 69(2009); 1651-1658	Search 3	Exploratory study descriptive	3	2 to 3	
Wright, DB. Care in the Country: A Historical case Study of Long-Term Sustainability in 4 Rural Health Centers. American Journal of Public Health. 2009;99:1612-1618	Search 3	Case study Policy Issue and Solution(?)	3	2	
Farmer, J., Lauder, W., Richards, H., Sharkey, S. Dr. John Has Gone: Assessing Health Professionals' Contribution to Remote Rural Community Sustainability in the UK. Social Science and Medicine 57 (2003) 673-686.	Search 3	Policy Issue Descriptive	3	2	

World Health Organization. Increasing Access to Health Workers in Remote and Rural Areas through Improved Retention. 2009	Search 3	Policy Issue Policy Solutions	3	2	
Johns, S., Kilpatrick, S., Whelan, J. Our Health in Our Hands: Building Effective Community Partnerships for Rural Health Service Provision. 2007 Rural society 17:1 50-65	Search 3 (gleaned from 1st Farmer paper)	Policy Solution	3	2	
Minore, B., Boone, M. Realizing Potential: Improving Interdisciplinary Professional/ Paraprofessional Health Care Teams in Canada's Northern Aboriginal Communities through Education. Journal of Interprofessional Care, Vol. 16, No. 2 2002 139-147	Search 4	Policy Solution	3	2 to 3	
McNair, R., Brown, R., Stone, N., Sims, J. Rural Interprofessional Education: Promoting Teamwork in Primary Health Care Education and Practice. Australian Journal of Rural Health 2001 9 (suppl.) 819-826	Search 4	Policy Solution	3	2	

Pathman, D.E., Crouse, B.J., Padilla, L.F., Horvath, T.V., Nguyen, T.T. American Recovery and Reinvestment Act and the Expansion and Streamlining of the National Health Service Corps: A Great Opportunity for Service-Minded Family Physicians. Journal of the American Board of Family Medicine. 2009 Vol.22 No. 5 582-584	Search 5	Policy Solution	3,4	1	
Pathman, D.E. What Outcomes Should we Expect from Programs that Pay Physicians' Training Expenses in Exchange for Service? North Carolina Medical Journal 2006 Vol. 67 No. 1 77-82	Search 5	Policy Solution	3	1	
Malaty, W., Pathman, D.E. Factors Affecting the Match Rate of Rural Training Tracks in Family Practice. Family Medicine 2002; 34(4):258-61	Search 5	Policy Solution	3	2 to 3	
Pathman, D.E., Konrad, T.R., King, T.S., Spaulding, C., Taylor, D.H. Medical Training Debt and Service Commitments: The Rural Consequences. The Journal of Rural Health 2000 Vol. 16 No. 3 264-272	Search 5	Policy Solution	3,4,5	2	

Pathman, D.E. Konrad, T.R., Dann, R., Koch, G. Retention of Primary Care Physicians in Rural Health Professional Shortage Areas. American Journal of Public Health 2004 Vol. 94 No. 10 1723-1729	Search 5	Primary data Policy Issue/ Solution(?)	3	1 to 2	
Pathman, D.E., Taylor, D.H., Konrad, T.R. State Scholarship, Loan Forgiveness, and Related Programs: The Unheralded Safety Net. JAMA 2000 284 (16): 2084-2092	Search 5	Primary data Policy Issue/ Solution(?) Note: data is from 1996	3,5	1 to 2	
Politzer, R.M., Triple, L.Q., Robinson, T.D., Heard, D., Weaver, D.L., Reig, S.M., Gaston, M. The National Health Service Corps for the 21st Century. Journal of Ambulatory Care Management 2000 23 (3), 70-85.	Search 5	Review Policy Issue Bulk of data is from 1991-1998	3,4	1 to 2	
Pathman, D.E., Konrad, T.R., Ricketts, T.C. The Comparative Retention of the National Health Service Corps and Other Rural Physicians. Results of a 9-year Follow-up Study. JAMA 1992, 268: 1552-1558	Search 5	Cohort Study Policy issue Data from 1980's	3,4	1	
Beachler, M., Holloman, C., Pathman, D.E. Lessons Learned in Phase I of the Southern Rural Access Program. 2003 The Journal of Rural Health Vol. 19 No. 5 (suppl.) 416-421	Search 5	program evaluation	3,5	2	

Pathman. D.E., Fryer, G.F., Phillips, R.L., Smucny, J., Miyoshi, T., Green, L.A. National Health Service Corps Staffing and the Growth of the Local Rural Non-NHSC Primary Care Physician Workforce. The Journal of Rural Health 2006 Vol. 22, No.4 285-293	Search 5	Primary Data	3,4	1	
Pathman, D.E., Konrad, T.R., Agnew, C.R. Predictive Accuracy of Rural Physician's Stated Retention Plans. The Journal of Rural Health. 2003 Vol.19, No.3 236-244	Search 5	Primary Data Data is from the 1990's	3	1	
Williams, E.S., Konrad, T.R., Scheckler, W.E., Pathman, D.E., Linzer, M., McMurray, J.E., Gerrity, M., Schwartz, M. Understanding Physicians' Intentions to Withdraw from Practice: The Role of Job Satisfaction, Job Stress, Mental and Physical Health. Health Care Management Review 2001 Vol. 26(1) 7-19	Search 5	Primary data Descriptive	6	3	No. No substantial description of factors affecting rural practice
Pathman, D.E., Konrad, T.R., Ricketts, T.C. The National Health Service Corps Experience for Rural Physicians in the Late 1980's JAMA 1994, 272: 1341-1348.	Search 5	Cohort Study Policy issue Data from 1980's	3,4	1 to 2	

Pathman, D.E., Williams, E.S., Konrad, T.R. Rural Physician Satisfaction: Its Sources and Relationship to Retention. The Journal of Rural Health 1996 Vol. 12 No.5 366-377	Search 5	Primary data (survey) Data is from 1987-1990	3,4		
Saxton, J., Johns, M.M.E. Grow the National Health Service Corps. JAMA 2009 301(18) 1925-1926	Unrelate d search	Commentary	4	1	
<a href="http://www.facs.org/ahp/views/gme3.html">http://www.facs.org/ ahp/views/gme3.html</a>	Unrelate d search	Commentary	2,4	1	

## Appendix 2: Interview Protocol

### Interview Protocol

1. I would like to learn about how you became interested in rural surgical (medical) care
  - 1a. (for rural surgeons) Tell me about practicing in a rural area? What drew you to that kind of practice? Why did you leave?
  - 1.b (for rural surgeons,) Who did you know who had taken a similar career path?
2. From my reading of the literature, the barriers to recruiting more surgeons to work in rural areas seem to be professional isolation, concerns about lifestyle, and on the part of general surgeons, their ability to perform a wider range of procedures. Does that seem right to you? What in your opinion are the barriers?

At the same time, the rewards seem to be a greater degree of independence and scope of practice. What in your opinion are the rewards?
3. Some researchers believe that special rural surgery rotations or curricula may increase the presence of surgeons in rural areas. How successful do you think this approach is? What other strategies do you think might work?
4. Some authors have written about the interdependence of rural family practitioners and rural general surgeons while some have emphasized the need for teams of physicians.

Do you think that the presence of surgeons is affected by the presence or absence of other types of physicians? What recruitment strategies might be successful to bring in physician teams?
5. a. What do you think has changed in rural surgery in the past 10-15 years?

b. (researchers, rural hospital executive, general surgeons) Do you think that expansion of NHSC funding to general surgeons would increase surgical presence in rural areas?
6. What are the most effective ways that rural areas can create the capacity that will attract general surgeons and other physicians? What do you think physicians contribute to the social capital of rural areas?
7. Mid-level practitioners have been touted as a means of increasing health care access in underserved areas. They are also a growing part of the surgical workforce. What do you see as their role in rural surgical practice?
8. Is there anything I have forgotten to ask you that you would like to comment on or that you think is important?

Thank you very much for your time! I greatly appreciate it! Is there anything I haven't thought of that you'd like to add?

I will be happy to provide you with a copy of this interview's transcript, if you would like. Thank you again!